PA 1244402

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

PCT/IB04/3375

United States Patent and Trademark Office

November 08, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: *60/583,592*
FILING DATE: *June 30, 2004*

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

TRUDIE WALLACE
Certifying Officer

PTO/SB/16 (04-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Haim	Wilder	Raanana, Israel

Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

DEVICE AND METHOD FOR AMELIORATING DRINKING WATER

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☑ Customer Number: 021884

OR

☐ Firm or Individual Name					
Address					
Address					
City		State		Zip	
Country		Telephone		Fax	

ENCLOSED APPLICATION PARTS *(check all that apply)*

☑ Specification *Number of Pages* 11 ☐ CD(s), Number _____

☑ Drawing(s) *Number of Sheets* 5 ☐ Other (specify) _____

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fees.

☑ The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 01-2221

☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE Amount ($): 80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE _____ Date 06/30/2004

TYPED or PRINTED NAME John L. Welsh REGISTRATION NO. 33,621 *(if appropriate)*

TELEPHONE 703 920 1122 Docket Number: TSI-077

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

DEVICE AND METHOD FOR AMELIORATING DRINKING WATER

BACKGROUND OF THE INVENTION

In a co - pending provisional application 60/549,144 a device was disclosed which facilitates the addition of supplements into purified drinking water. The supplements are released as the drinking water exits a filter. The agents are therefore added into the water downstream in a succession following their purification.

Sustained delivery (also known as controlled delivery or release) of drugs and fertilizers as well as other agents, is known in the art. Controlled delivery into aqueous environments is predominantly obtained using osmotic driven mechanism. In this mechanism water is imbibed into the device across a semi-permeable membrane due to a lower concentration of water in the device core than in the environment of use. This creates a positive hydrostatic pressure in the device core resulting in release of the beneficial agent contained in the core. Most osmotic delivery systems provide sustained delivery of a beneficial agent (e.g., Baker, R.W., 1987, Controlled Release of Biologically Active Agents John Wiley & Sons pp 132-155; and Smith, K.L. and Herbig, S.M., 1992 "Controlled Release" in Membrane Handbook Ho, W.S.W., and Sirkar, K. K., eds., Van Nostrand Reinhold, pp 915-935).

While numerous delivery systems have been described in prior art for the release of drugs into the biological system, little attention was given to the controlled release of beneficial agents in media other than the human or animal body. This is particularly relevant for the application of osmotically controlled delivery systems for enrichment of drinking water.

LIST OF FIGURES

Fig. 1A is a cross section in a bottle of the invention with compartments contracted;

Fig. 1B is a cross section in a bottle of the invention with compartments distended;

Fig. 2 is an external isometric view of a capsule retainer of the invention;

Fig. 3A is an isometric view of an indicator of the invention;

Fig. 3B is an isometric view of an indicator of the invention embedded in a capsule;

Fig. 4A is an isometric view of a capsule of the invention having one compartment;

Fig. 4B is an isometric view of a capsule of the invention with internally disposed capsules;

Fig. 4C is an isometric view of a capsule of the invention with an internal capsule for delayed delivery;

Fig. 4D is an isometric view of a capsule of the invention having serially disposed compartments;

Fig. 5 is an isometric view of a radially compartmentalized capsule.

DESCRIPTION OF THE PRESENT INVENTION

In a bottle of the invention, an upper water compartment and a lower water compartment, both of a variable volume, are made to carry out water purification as well as amelioration. In **Fig. 1A** a cross section in a bottle of the invention is described schematically, showing a lower water compartment **10** and upper water compartment **12**. Filtering member **14** is disposed between the two water compartments. Water spout **16** is connected to the lower water compartment. The lower and upper water compartments are expandable as described in **Fig. 1B**. Each water compartment is autonomously expandable. A stopper **18** shown in **Fig. 1A** shuts off spout **16** and stopper **20** shuts off water filling orifice **22**. In order to fill the bottle with available water, the upper water compartment is distended as described in **Fig. 1B**, water trickles by gravitation through filtering member **14**, filling the lower water compartment with filtered water, ready to be consumed through spout **16**. In order to facilitate the expansion of both water compartments, one – way air valves are installed in stopper **18** and **20**, respectively, allowing intake of air as the water compartments are distended.

In another aspect of the invention, described in **Fig. 2** to which reference is now made, an essentially porous retainer **30** disposed downstream relative to filter **32**, is used for retaining a sustained delivery capsule (not shown). The retainer may have one compartment, such as compartment **34** which drains the incoming water that also partially extract beneficial agents from

the capsule retained inside the retainer, into the lower water compartment. In the embodiment shown, another compartment is appended at the bottom of compartment **34**. Thus compartment **36**, being less porous then compartment **34** retains some amount of water even when trickling from above stops, allowing for more beneficial agents to be extracted from the capsule through holes **38**. The position and distribution of holes **38** determine somewhat the retention of water in the compartment **36**, bathing the capsule therein.

In another aspect of the invention, a distinctly visible indicator is embedded in the capsule, such that when the capsule is depleted, the indicator is made clearly visible through the bottle, providing that the bottle and retainer are sufficiently transparent. This is explained with reference to **Figs 3A – B**. In **Fig. 3A** the indicator rod **42** and base are shown. In **Fig. 3B** the indicator rod is shown bulging out of capsule **44**, partially broken. When the capsule is spent, the indicator rod, preferably colored vividly, shows up.

The beneficial agents

The chemical agents of the invention are soluble or otherwise water – dispersible, one or a plurality of compounds or mixtures improving the quality of the water produced in the filtration. A non exhaustive list of such agents contains minerals, medications, vitamins and micronutrients, and herbal extracts. The mineral included in a capsule may such as accommodated to and age of the user, to known local geographic deficiencies or to personal requirements. Medications may be administered using the capsule of the inventions for reasons

such as to facilitate intake, for example in malaria stricken area, preventive malaria drug can be administered by way of the capsule of the invention.

The osmo - active agents (osmoagent)

To be used as an osmoagent the material must interact with water. Salts and non - charged molecules may be used. The size and electrical charge of the osmoagent are properties which are involved in the determination of the capability of the agent to permeate semi – permeable barriers. Pressure boosters can be used in addition to the osmoengine. For example CO_2 liberating combinations of salts and acids may provide pressure in addition to the pressure generated by the osmoagent.

Some examples

In a preferred embodiment of the invention, the osmoagent is also a beneficial agent to be delivered to the potable water collected in the lower water compartment. As can be seen in **Fig. 4A**, a sustained delivery capsule **60** contains only one compartment with four holes perforating the outer envelope, occupied by the osmoagent. The outer envelope is made of impermeable polymer. The filling is typically made of compressed beneficial agent such as calcium and magnesium salts. The capsule becomes immersed in water in the retainer located below the filter as soon as the water tricle downwards from the filter. Water saturates the holes **62** and penetrates the inner compartment of the

capsule. As the osmoagent dissolves, the high concentration around the dissolution site draws water by diffusion, and osmotic pressure builds accordingly. Water bearing a high concentration of solutes is pushed out of the holes or some of them while fresh water enters the capsule from the outside, dissolving more and more of the inner filling of the capsule. Typically, the dynamic state will eventually favour one perforation as an entrance and another perforation as an exit. Therefore in capsules of the invention, perforations will typically be provided in couples or triplets. However, for large enough holes, entry of fresh water and exit of solute laden water may be achieved in one perforation.

In another embodiment of the invention, the one or more osmoagents are not beneficial agents playing role as amelioration agents. Another capsule variant is one which internally included capsules are contained inside the capsule as can be seen in **Fig. 4B**. Each such included capsule typically contains a different beneficial agent. For example the osmoagent in the compartment **70** is liberated into the water at slow rates. Internal compartments **72** containing for example vitamins liberate their contents at even slower rate and at even smaller amounts. The capsule in this case is coated using a semipermeable plastic coat that allows water to enter but no solute to exit. Perforations in the external capsule dictate the rate of liberation of the osmoagent into the outside water. The internal compartments **72** are compressed by the build up of pressure un the capsule and are made to liberate their contents into the outside water as a function of their perforation (not shown) and the amount of pressure applied by the osmoagent in compartment **70**. The

osmoagent is used in **Fig. 4C** only as powering agent for the osmoengine that drives the beneficial agents out of the capsule as shown. The outer compartment is filled with a soluble agent used to delay the beginning of exposure of the internal capsule **76** to the water. In **Fig. 4D**, an alternating capsule segment system is shown, in which osmoengines **80** and **86** are used to drive beneficial agents out of compartments **82** and **84.** Compartments **80** and **86** each have a semi-permeable wall through which only water can penetrate. The internally disposed solutes cannot penetrate the semi permeable wall and are therefore used to power the osmoengine by drawing water inside the respective segments and push the adjacent leaky segments containing beneficial agents.

Additional configurations of the capsule and other chemical combinations are described hereinafter. First, the segments within a capsule can be arranged longitudinally, as described in **Fig. 5.** Generally impermeable capsule **90** contains three longitudinal segments. Segment **A** is bound by two longitudinal walls, **92** and **94** in addition to the peripheral one. Sement B is bound by longitudinal walls **92** and **96** and segment c is bound by walls **94** and **96,** in addition to the peripheral walls. This configuration permits the liberating of one or more beneficial agents from a specific segment. For other reasons, it may be beneficial to keep certain ingredients separated in different segments.

Properties of the perforations

The number of preformed perforations effected in the capsule, can be made to set a specific rate of beneficial agent dissolution into the water. However there are several parameters associated with the perforations that may be manipulated to vary the rate of liberation of beneficial agents to the water. The distribution of perforations along the longitudinal dimension of the capsule influences rate and longevity of the capsule, as more perforations at the bottom increase the total time of immersion of the bulk of the capsule filling within the water. The shape of the perforations can have an effect on the rate of flow as the more the shape deviates from the true circle, the smaller the effective area of the perforations and the flow rate tend to be lesser. A slit perforation favours opening to the outside, whereas a flap installed on the inside to cover the perforation, favours incoming stream. Partial occlusion may be applied to the perforation to slow the dissolution and distribution of the chemical agents in the water.

CLAIMS

1. A bottle for providing ameliorated drinking water wherein a capsule retainer for retaining a capsule containing at least one beneficial agent and at least one osmoagent is disposed downstream the trickle of filtered water below a filter, and wherein the beneficial agent goes through sustained delivery liberating agents to said water.

2. A bottle for providing ameliorated drinking water as in claim 1 and wherein an indicator becomes visible when the beneficial agent is depleted.

3. A capsule for sustained delivery of at least one beneficial agent to filtered water containing at least one osmoengine powered by at least one osmoagent.

4. A capsule for sustained delivery of at least one beneficial agent to filtered water as in claim 3 employing a pressure booster in addition to said osmoengine.

5. A capsule for sustained delivery of at least one beneficial agent as in claim 3 and wherein said beneficial agent is an osmoagent.

6. A capsule for sustained delivery of at least one beneficial agent as in claim 3 wherein said capsule contains one compartment.

7. A capsule for sustained delivery of at least one beneficial agent as in claim 3 and wherein said at least one beneficial agent and said at least one osmoengine occupy different compartments.

8. A method for obtaining ameliorated drinking water comprising the steps of:

- subjecting a capsule containing at least an osmoengine and at least one beneficial agent to a trickle of filtered water;
- extracting said at least one beneficial agent from said capsule into said water, and
- collecting said water in a compartment.

9. A method for obtaining ameliorated drinking water as in claim 8 and wherein said beneficial agent powers said osmoengine.

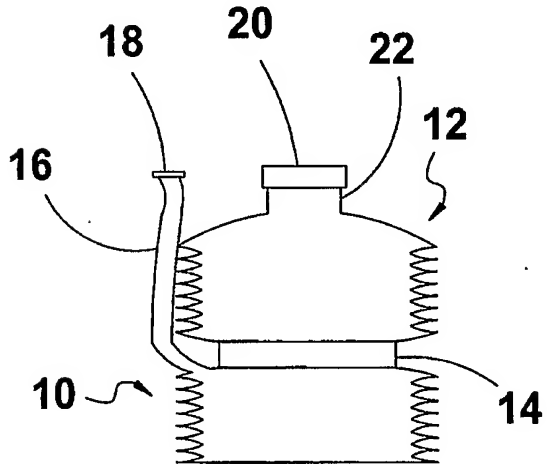

Fig. 1A

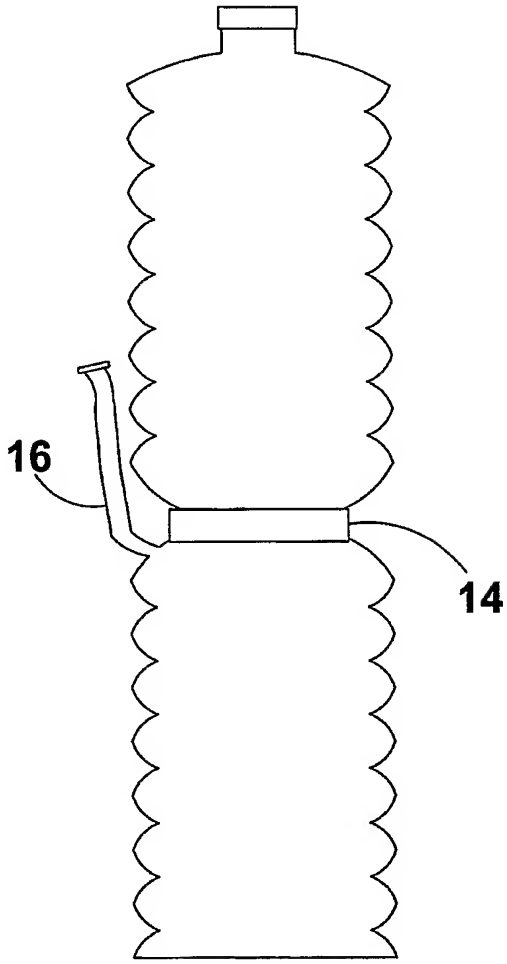

Fig. 1B

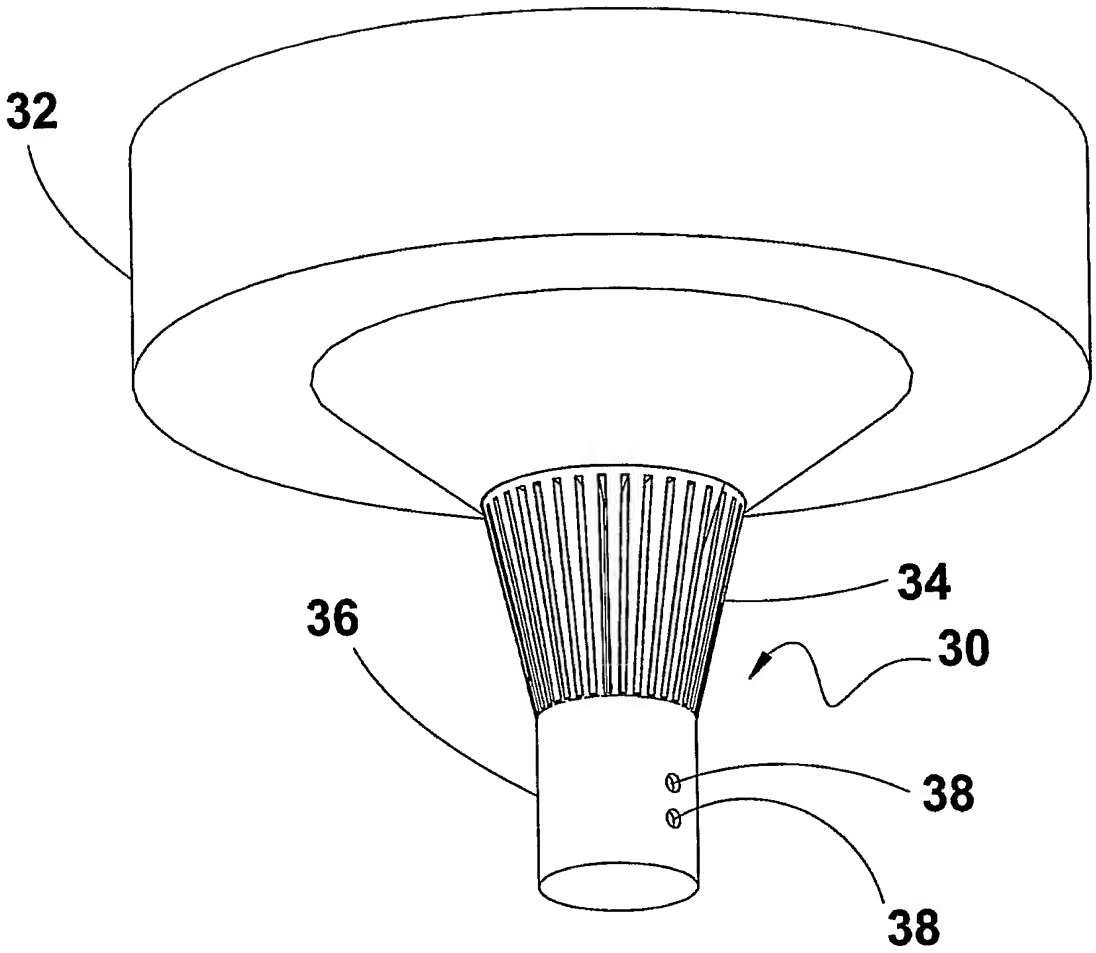

Fig. 2

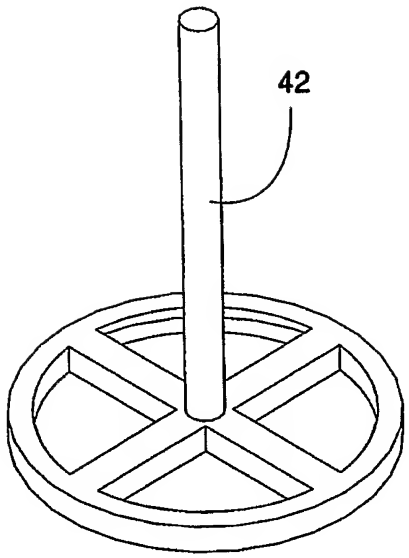

Fig. 3A

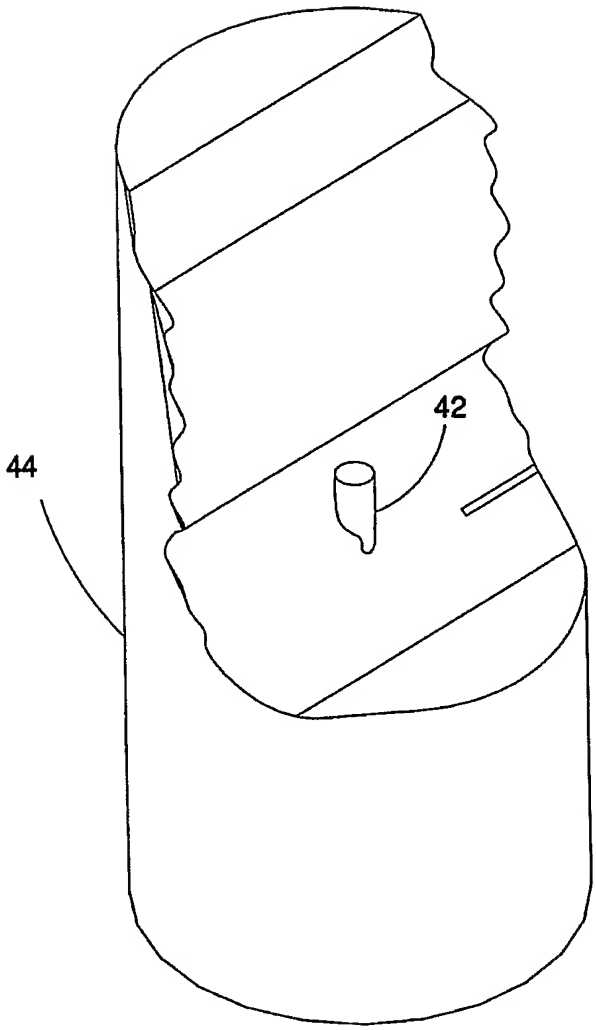

Fig. 3B

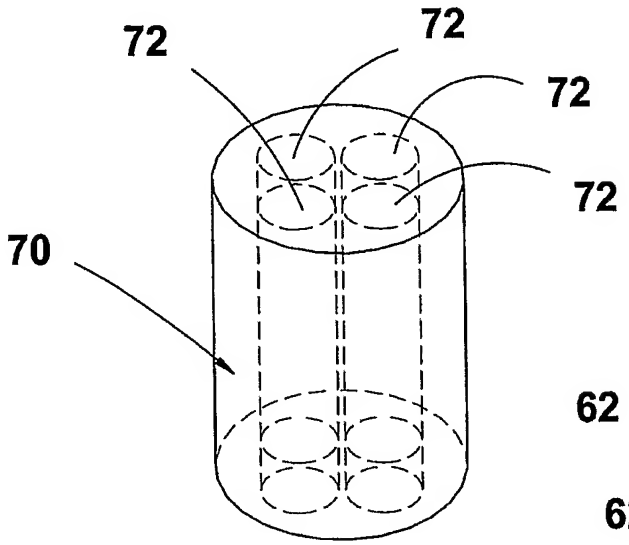

Fig. 4B

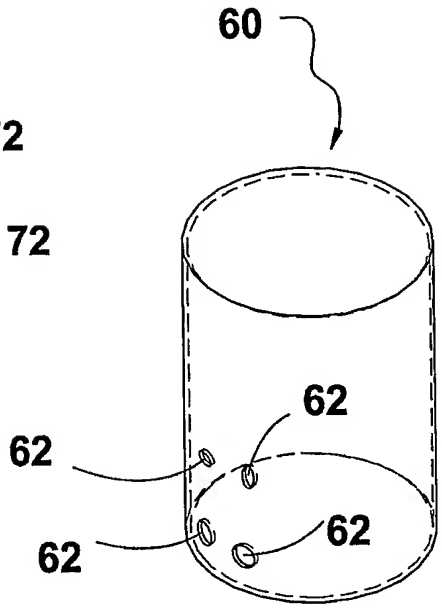

Fig. 4A

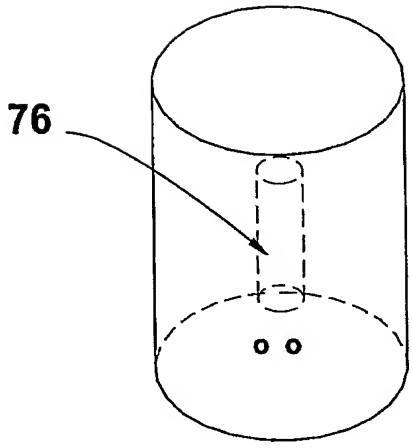

Fig. 4C

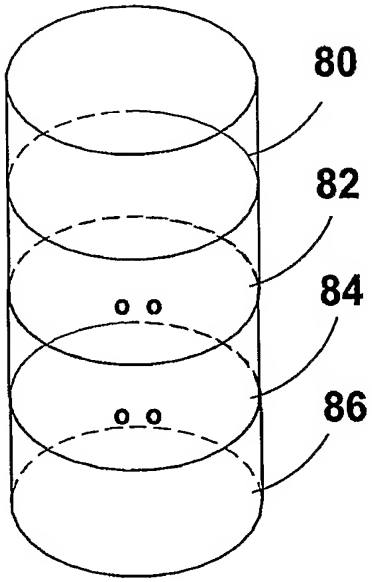

Fig. 4D

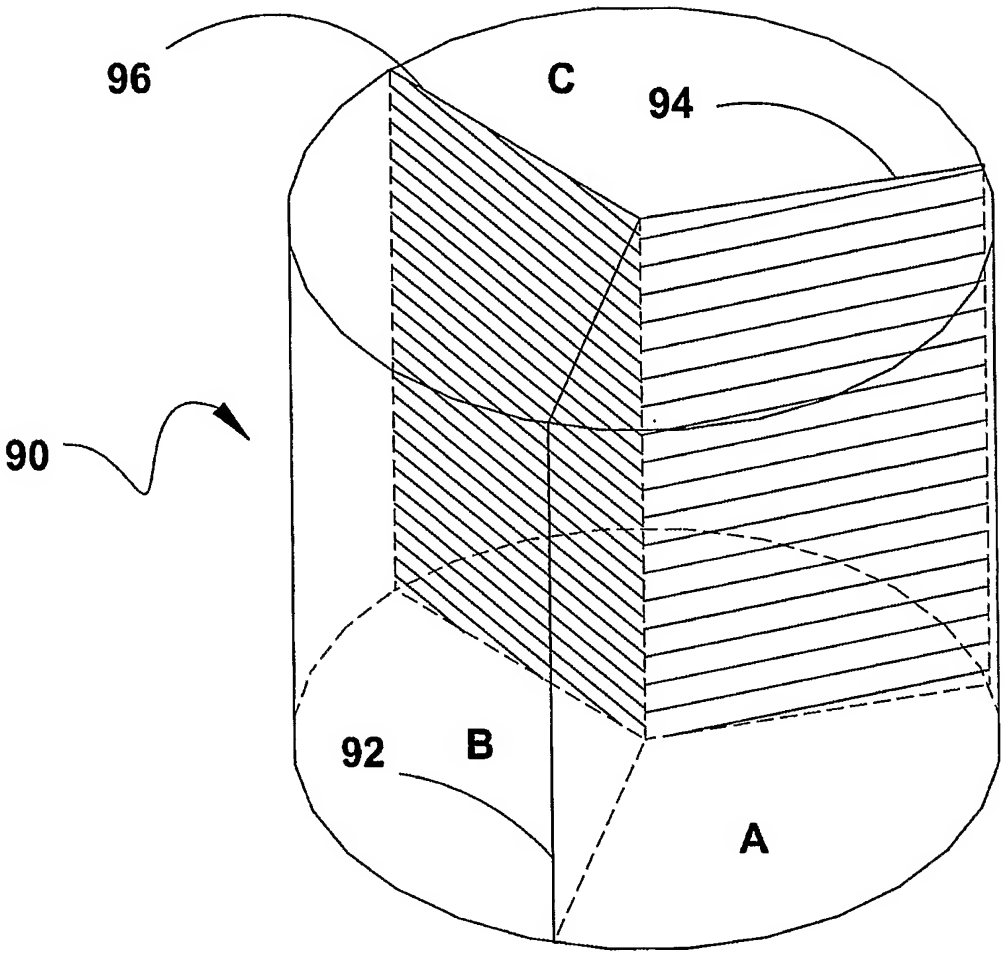

Fig. 5